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Docket No. 1293.1950

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of :

Kyoung-hwan PARK et al. :

Serial No. 10/678,750 : Group Art Unit: 2627

Filed: October 3, 2003 : Examiner: LaTanya BIBBINS

For: APPARATUS AND METHOD FOR GENERATING TRACKING ERROR SIGNAL AND OPTICAL RECORDING/REPRODUCING SYSTEM USING SAME

APPEAL BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In a Notice of Appeal and in a Pre-Appeal Brief Conference filed April 17, 2009, the Applicants appealed the Examiner's November 26, 2008 Office Action finally rejecting claims 1-23. The Decision in response to the Pre-Appeal Brief Conference Request was issued on July 31, 2009. Therefore, Appellants' Brief is due August 31, 2009 (the later of two months from the filing of the Notice of Appeal or one month from the mail date of the Decision). Appellants' Brief, together with the requisite fee set forth in 37 C.F.R. §1.17, is submitted herewith.

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I. Real Party in Interest (37 C.F.R. § 41.37(c)(1)(i))

The real party in interest in this Appeal is Samsung Electronics Co., Ltd., the assignee of the subject application.

II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))

Appellants, Appellants' legal representatives, and the assignee are not aware of any other appeals or interferences which will directly affect or be directly affected by, or have a bearing on, the Board's decision in the pending Appeal.

III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))

Appealed claims 1-23 have been rejected and are appealed. Claims 1-23 are the only pending claims in the subject application.

IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))

Appellants' Response filed January 22, 2009 was considered for purposes of Appeal as indicated by the Advisory Action mailed March 17, 2009.

V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))

The present invention relates to a tracking error signal generating apparatus. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed apparatus, as set forth in independent claim 1, includes a main beam push pull (MPP) signal generating unit 701, a side beam push pull (SPP) signal generating unit 702, a high-pass filter 703, and a subtractor 704 (see Fig. 7, pp. 10-11, paragraphs 0039 and 0042-0043, for example). The MPP signal generating unit 701 generates an MPP signal according to electrical signals output by main photodetecting units PD_A, PD_B, PD_C, PD_D based on a calculated deviation of beam powers detected by the main photodetecting units PD_A, PD_B, PD_C, PD_D arranged on right and left sides of a specific track, respectively (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The SPP signal generating unit 702 generates an SPP signal according to electrical signals output by photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F based on a calculated deviation of beam powers detected by the photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F are one of pairs of the main photodetecting units PD_A, PD_B, PD_C, PD_D diagonally arranged with respect to the track and side photodetecting units PD_E and PD_F disposed on opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, PD_D (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The high-pass filter 703 removes an AC component from the SPP signal such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). The subtractor 704 generates a tracking error signal by calculating a difference between the MPP signal and the DC components of the SPP signal (see Fig. 7, p. 11, paragraph 0043, for example).

The present invention relates to a method of generating a tracking error signal. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed method, as set forth in independent claim 4, calculates a difference between an MPP signal and an SPP signal whose AC components are removed via a high-pass filter 703 such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042-0043, for example). The MPP signal is obtained by calculating a deviation of beam powers detected by main photodetecting units PD_A, PD_B, PD_C, PD_D which are arranged in right and left directions with respect to a track and the SPP signal is obtained by calculating a deviation of beam powers detected by photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F which are one of pairs of the main photodetectors PD_A, PD_B, PD_C, PD_D diagonally arranged with respect to the track and side photodetecting units PD_E, PD_F disposed on opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, PD_D (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The high-pass filter 703 is connected in series between an output terminal of a generator 702 of the SPP signal and a ground terminal (see Fig. 7, for example).

The present invention relates to an optical recording/reproducing system. Referring to Figs. 1A, 1B, 6 and 7, pp. 9-11, paragraphs 0030-0043, the present claimed system, as set forth in independent claim 7, includes a pickup 602, a tracking error signal generating unit 603, a high-pass filter 703, a servo controller 604, and a tracking servo driving unit 606 (see Figs. 6 and 7, pp. 9-11, paragraphs 0030-0033, 0037, 0039 and 0042, for example). The pickup 602 emits a laser beam toward an optical medium and detects a reflected laser beam reflected from a disc 601 (see Fig. 6, page 9, paragraph 0031, for example). The tracking error signal generating unit 603 generates a tracking error signal by calculating a difference between an MPP signal obtained by calculating a deviation of beam powers detected by main photodetecting units PD_A, PD_B, PD_C, PD_D which are arranged in right and left directions with respect to a track and an SPP signal obtained by calculating a deviation of beam powers detected by photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F which are one of main photodetecting units PD_A, PD_B, PD_C, PD_D diagonally arranged with respect to the track and signals output by side photodetecting units PD_E, PD_F disposed on opposing sides of the main photodetectors PD_A, PD_B, PD_C, PD_D (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The high-pass filter 703 removes AC components from the SPP signal such that only DC components of the SPP signal remain, the AC components being removed before the signal is received by the tracking error signal generating unit (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). The servo controller 604 generates a tracking driving signal which is used to move an optical system of the pickup 602 in a radial direction so as to direct the laser beam at a center of the track, using the tracking error signal (see Fig. 6, pp. 9-10, paragraph 0035, for example). The tracking servo driving unit 606 drives a tracking actuator included in the pickup 602 in response to the tracking driving signal (see Fig. 6, p. 10, paragraph 0037, for example).

The present invention relates to a computer readable medium encoded with processing instructions for implementing a method of generating a tracking error signal. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed method, as set forth in independent claim 10, calculates a difference between an MPP signal and an SPP signal whose AC components are removed via a high-pass filter 703 such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042-0043, for example). The MPP signal is obtained by calculating a deviation of beam powers detected by main photodetecting units PD_A, PD_B, PD_C, PD_D which are arranged in right and left directions with respect to a track and the SPP signal is obtained by calculating a deviation of beam powers detected by photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F which are one of pairs of the main photodetectors PD_A, PD_B, PD_C, PD_D diagonally arranged with respect to the track and side photodetecting units PD_E, PD_F disposed on opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, PD_D (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The high-pass filter 703 is connected in series between an output terminal of a generator 702 of the SPP signal and a ground terminal (see Fig. 7, for example).

The present invention relates to a tracking error signal generator. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed generator, as set forth in independent claim 11, includes a main beam push pull (MPP) signal generating unit 701, a side beam push pull (SPP) signal generating unit 702, a high-pass filter 703, and a subtractor 704 (see Fig. 7, pp. 10-11, paragraphs 0039 and 0042-0043, for example). The MPP signal generating unit 701 generates an MPP signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on an opposing side of the track (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The SPP signal generating unit 702 generates an SPP signal based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions PD_A, PD_B, PD_C, PD_D which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D diagonally disposed with respect to the track in a second direction normal to the first and a fifth signal output by a first side photodetector PD_E or PD_F and a sixth signal output by a second side photodetector PD_E or PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The high-pass filter 703 removes an AC component from the SPP signal such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). The subtractor 704 generates a tracking error signal by calculating a difference between the MPP signal and the DC components of the SPP signal (see Fig. 7, p. 11, paragraph 0043, for example).

The present invention relates to a method of generating a tracking error signal. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed method, as set forth in independent claim 14, generates a main push pull (MPP) signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on an opposing side of the track (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The method further generates a side push pull (SPP) signal based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions PD_A, PD_B, PD_C, PD_D which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D diagonally disposed with respect to the track in a second direction normal to the first and a fifth signal output by a first side photodetector PD_E or PD_F and a sixth signal output by a second side photodetector PD_E or PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The method removes an AC component from the SPP signal via a high-pass filter 703 such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). A tracking error signal is generated based on a difference between the MPP signal and the DC components of the SPP signal (see Fig. 7, p. 11, paragraph 0043, for example).

The present invention relates to a computer readable medium encoded with processing instructions for implementing a method of generating a tracking error signal. Referring to Figs. 1A, 1B and 7, pp.10-11, paragraphs 0039-0043, the present claimed method, as set forth in independent claim 17, generates a main push pull (MPP) signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions PD_A,

PD_B, PD_C, PD_D disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on an opposing side of the track (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The method further generates a side push pull (SPP) signal based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions PD_A, PD_B, PD_C, PD_D which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D diagonally disposed with respect to the track in a second direction normal to the first and a fifth sum signal output by a first side photodetector PD_E or PD_F and a sixth sum signal output by a second side photodetector PD_E or PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The method removes an AC component from the SPP signal via a high-pass filter 703 such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). A tracking error signal is generated based on a difference between the MPP signal and the DC components of the SPP signal (see Fig. 7, p. 11, paragraph 0043, for example).

The present invention relates to an optical recording/reproducing system. Referring to Figs. 1A, 1B, 6 and 7, pp. 9-11, paragraphs 0030-0043, the present claimed system, as set forth in independent claim 20, includes a pickup 602, a high-pass filter 703, a tracking error signal generator 603 and a servo controller 604 (see Figs. 6 and 7, pp. 9-11, paragraphs 0030-0033, 0037, 0039 and 0042, for example). The pickup 602 has a light beam generator which generates a light beam, an optical system which focuses the light beam onto an optical medium, a focus/tracking actuator which moves the optical system in a radial direction with respect to the optical medium in response to a tracking driving signal so as to direct the light beam at a specific track on the optical medium, and a photodetector section including main photodetecting portions PD_A, PD_B, PD_C, PD_D which receive the light beam after the light beam is reflected from the optical medium and output respective signals in response thereto (see Figs. 1A, 1B and 6, page 9, paragraph 0031, for example). The high-pass filter 703 removes AC components from the SPP signal such that only DC components of the SPP signal remain, the AC components being removed before the signal is received by the tracking error signal generating unit (see Fig. 7, p. 11, paragraph 0042, for example). The high-pass filter 703 is connected in series between an output terminal of the SPP signal generating unit 702 and a ground terminal (see Fig. 7, for example). The tracking error signal generator 603 generates a tracking error signal representing a difference between a main push pull (MPP) signal and a side push pull (SPP) signal (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The servo controller 604 generates the tracking driving signal based on the tracking error signal (see Fig. 6, pp. 9-10, paragraph 0035, for example). The MPP signal is generated based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D disposed on an opposing side of the track (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The SPP signal is generated based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions PD_A, PD_B, PD_C, PD_D which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions PD_A, PD_B, PD_C, PD_D diagonally disposed with respect to the track in a second direction normal to the first and a fifth signal output by a first side photodetector PD_E or PD_F and a sixth signal output by a second side photodetector PD_E or PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example).

The present invention relates to a filter in a tracking error signal generating circuit which generates a tracking error signal using a differential push pull method. Referring to Figs. 1A, 1B, 6 and 7, pp. 9-11, paragraphs 0030-0043, the present claimed filter 703, as set forth in independent claim 23, includes a high-pass AC component remover which removes an AC component from a side beam push pull (SPP) signal such that only DC components of the SPP signal remain (see Fig. 7, p. 11, paragraph 0042, for example). The SPP signal is obtained by using electrical signals output by photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F based on a calculated deviation of beam powers detected by the photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F (see Figs. 1A, 1B and 7, p. 11, paragraph 0046, for example). The photodetecting units PD_A, PD_B, PD_C, PD_D, PD_E, PD_F are one of pairs of the main photodetecting units PD_A, PD_B, PD_C, PD_D diagonally arranged with respect to the track and side photodetecting units PD_E and PD_F disposed on opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, PD_D (see Figs. 1A, 1B, pp. 10 and 11, paragraphs 0041, 0046). The tracking error signal can be stably generated regardless of a disc track pitch (see p. 11, paragraph 0045). The high-pass AC component remover is connected in series between an output terminal of a generator 702 of the SPP signal and a ground terminal (see Fig. 7, for ex.).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))

The rejection of claims 1-23 under 35 U.S.C. § 103(a) over U.S. Patent No. 4,787,076 to Deguchi et al. ("Deguchi") in view of the Applicants' Alleged Admitted Art (alleged by the Examiner to be Admitted Prior Art, but contested by the Applicants) is to be reviewed on appeal.

VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))

The Reference

Deguchi

Deguchi is directed to an optical disc tracking system in which a main beam tracking error signal T_{E0} and a tracking error signal T_{E1} resulting from two auxiliary beams can be obtained from the equations $T_{E0} = (SC + SD) - (SA + SB)$ and $T_{E1} = SE - SF$ (see Figs. 2, 7, col. 4, lines 19-31, for example). The optical disk tracking system includes a processing circuit for producing a feedback controls signal on the basis of the tracking error signals signal T_{E0} and T_{E1} (see Fig. 7, for example). The circuit includes a low pass filter 109 for extracting only a low frequency component of the tracking error signal T_{E1} and a differential circuit 110 for performing addition or subtraction between the output of the low pass filter 109 and the tracking error signal T_{E0} according to the push-pull system.

Applicants' Alleged Admitted Art

The Examiner has repeatedly alleged that "providing a low-pass filter in series with a signal output results in the equivalent frequency response as connecting a high-pass filter to ground at the signal output (i.e. removing AC components from a signal and allowing DC components to pass)." The Applicants have repeatedly asserted that a low-pass filter does not result in the equivalent frequency response as a high-pass filter. In particular, providing a low-pass filter in series with a signal output does not result in AC components being removed from a signal such that only DC components can pass.

The Applicants have repeatedly asked the Examiner to provide support for such an assertion. While the Examiner has provided support that low pass filters and high pass filters are similar in that they may maintain the same elements in different positions, the Examiner has failed to provide proper support for the assertion that a low pass filter in series results in the equivalent frequency response as a high-pass filter to ground. A low pass filter and a high pass filter provide for different frequency responses, particularly as to what frequency components are able to pass through the filter.

For example, as shown in Deguchi, a low pass filter in series with a signal output, such as filter 109, does not remove the AC components from the signal, allowing only DC components to pass. Thus, it is unclear as to how the low-pass filter, which only allows low frequency components of the signal to pass, in series with a signal output would be equivalent to a high-pass filter, which only allows high frequency components of the signal to pass, connected in series between an output terminal and a ground terminal. The filters are not equivalent structures and provide for different filtering capabilities and different frequency components to be able to pass therethrough.

In addition, the Applicants implicitly traversed the Examiner's assertion of Official Notice in the Amendment filed August 28, 2007 by arguing that a high-pass filter which removes all AC components from the SPP signal such that only DC components of the SPP signal remain does provide a benefit distinct from that of a low-pass filter in series with a signal output in response to the Examiner's assertion that a high-pass filter does not solve any stated problem or is for any particular purpose and it appears that the invention would perform equally well with a low-pass filter in series. The Applicants clarified why a high-pass filter to ground does not result in the equivalent frequency response as a low-pass filter in series with a signal output – because the high pass filter removes all AC components from the SPP signal such that only DC components of the SPP remain, then a "DPP signal can be stably generated regardless of disc track pitch, as stated, for example, in paragraph [0045] of the present application." Thus, the Applicants were arguing against the Examiner's assertion that a high pass filter to ground results in the same frequency response as a low-pass filter in series with the SPP signal. By arguing that a high-pass filter does solve a problem and is for a particular purpose, the Applicants did traverse the Examiner's assertion of Official Notice.

In the subsequent Office Action, the Examiner did not include an explanation as to why the traversal was inadequate, as is required by M.P.E.P. § 2144.03. Thus, the Applicants' arguments traversed the Examiner's assertion of Official Notice and the Examiner did not include an explanation as to why the traversal was inadequate.

Additionally, the Applicants repeatedly traversed the Examiner's assertion in numerous subsequent Office Actions, arguing that a high-pass filter in series between a signal output and a ground terminal that removes all AC components from a signal such that only DC components remain is not equivalent to a low-pass filter in series with a signal output and does not provide an equivalent frequency response as the low-pass filter. In particular, the Applicants argued that a low-pass filter only filters low frequency components and a high-pass filter filters high frequency components. By placing the low-pass filter in series with a signal output does not therefore result in the low-pass filter having high-pass capability – i.e., does not allow the low-pass filter to filter high frequency components. In addition, Deguchi specifically discloses that the low-pass filter in series with the signal output only outputs low frequency components of the signal. Thus, the low-pass filter in series with the signal output does not have the equivalent frequency response as a high-pass filter connected in series between an output terminal of a signal output and a ground terminal. Low-pass and high-pass filters output different frequency components, as the Applicants have asserted numerous times.

Further, while M.P.E.P. § 2144.03 provides guidance to the Examiner as to determining whether the traversal is not adequate and that the Examiner may clearly indicate in the next Office Action that the common knowledge or well-known in the art statement is taken to be admitted prior art, M.P.E.P. § 2144.03 provides no reference to the C.F.R. or to case law that supports that a lack of or inadequate traversal necessarily results in the admission that the statement at issue is admitted prior art. The Applicants respectfully submit that the M.P.E.P. does not recite that the Applicant must acquiesce to this assertion and particularly points out that, when requested, the Examiner must provide substantiary evidence to support his/her contention.

While the Examiner provides evidence that a low-pass filter and a high-pass filter are structurally similar, the Examiner provides no support that providing a low-pass filter in series with a signal output results in an equivalent frequency response as a high-pass filter in series between a signal output and a ground terminal.

Independent Claims 1, 4, 7, 10, 11, 14, 17, 20 and 23

Independent claim 1 recites:

> a high-pass filter which removes an AC component from the SPP signal such that only DC components of the SPP signal remain....

Independent claims 4, 7, 10, 11, 14, 17, 20 and 23 recite the same or similar features.

The present invention includes a high-pass filter 703 which removes an AC component from the SPP signal such that only DC components remain. As the filter 703 removes the AC component from the signal such that only DC components remain, only DC components of the signal are input to the subtractor 704.

Conventionally, a change in a disc track pitch results in a change in the amplitude of an AC component waveform of an SPP signal, thereby preventing stable generation of a DPP signal. However, as the high-pass filter 703 of the present invention removes AC components from the SPP signal, as a result, a DPP signal can be stably generated regardless of disc track pitch (see p. 11, paragraph 0045 of the present specification).

Further, Figs. 8 and 9 illustrate the differences between the conventional optical recording/reproduction system (Fig. 9) and the present invention (Fig. 8). Comparing Fig. 8 with Fig. 9, the waveforms of the DPP signal, the MPP signal and the SPP signal that are generated in Fig. 8 are distinct from the waveforms of the DPP signal, the MPP signal and the SPP signal that are generated in Fig. 9. By removing the AC components from the SPP signal, the present invention results in a DPP signal that can be stably generated regardless of disc track pitch.

Deguchi and the Alleged Admitted Art v. the Present Invention

Deguchi does not provide for a filter in which AC components are removed from the SPP signal. In Deguchi, only low frequency components of the signal are allowed to pass. Deguchi does not suggest that AC components are removed such that only DC components remain. In Deguchi, the filter 109 only extracts a low frequency component of the signal. The filter 109 of Deguchi does not remove the AC components – the filter 109 only removes the low frequency components, which are not specifically AC components of a signal.

Further, as discussed above, a low pass filter in series with a signal output does not result in an equivalent frequency response as connecting a high pass filter between a signal output and a ground terminal. The high pass filter of the present invention specifically filters AC components of the signal such that only DC components remain. The low pass filter 109 of Deguchi only filters low frequency components of the signal. A low pass filter 109 that does not filter AC components does not have an equivalent frequency response as a high pass filter connected between a signal output and a ground terminal.

Design Choice

Although the Applicants repeatedly assert that the low pass filter as in Deguchi does not result in an equivalent frequency response as the high pass filter of the present invention, the Applicants assert that, even assuming, *arguendo*, that the low pass filter does result in an equivalent frequency response as the high pass filter of the present invention, the Examiner fails to provide an adequate rationale to modify the low pass filter of Deguchi to provide a high pass filter to ground.

The Examiner cites as an apparent reason with rational underpinning that "[i]t would have been an obvious matter of design choice to provide a high-pass filter to ground versus having a low-pass filter in series with the SPP signal since the applicant has not disclosed that a high-pass filter solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with a low-pass filter in series."

With regard to "an obvious matter of design choice," M.P.E.P. § 2144.04(VI)(C) states that "[t]he mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device [emphasis added]." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). Thus, as similarly discussed in KSR International v. Teleflex, it is not enough to merely assert that it is an obvious matter of design choice, but the Examiner must provide some rationale as to why it would be an obvious matter of design choice.

The Examiner's assertion that "...since the applicant has not disclosed that a high-pass filter solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with a low-pass filter in series" is not an apparent reason with rational underpinning as to why Deguchi would have been modified as suggested by the Examiner.

The Examiner fails to articulate how a high pass filter substituted for the low pass filter 109 of Deguchi, which does not remove AC components such that only DC components are output, would be "an obvious matter of design choice."

The Examiner's only apparent reason or "motivation" is merely that the Applicant has not disclosed that a high-pass filter solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with a low-pass filter in series.

However, the Applicants have disclosed that a high-pass filter solves a stated problem or is for a particular purpose. Further, the invention would not perform equally well with a low-pass filter that does not remove the AC components such that only the DC components remain.

The arrangement of a high-pass filter in series between an output terminal of a SPP signal generating unit and a ground terminal, where the high-pass filter removes AC components from the SPP signal such that only DC components of the SPP signal remain, is not an obvious matter of design choice because the arrangement does solve a stated problem.

At paragraphs 0012 and 0015 of the present disclosure, one of the problems to be solved is that a change in a disc track pitch makes it difficult to precisely match the phases of an MPP and an SPP signal, thereby preventing stable generation of the DPP signal. To solve this problem, as discussed at paragraph 0016 of the present disclosure, Korean Pub. No. 2002-42200 suggests compensating for a difference between the phases of a MPP signal and a SPP signal by changing a gain value k. However, for the compensation, both a circuit that detects a phase difference between the MPP signal and the SPP signal and a circuit that changes a gain value k based on the detected phase difference are required to be additionally installed. The installation of these circuits, however, complicates a circuit structure of the system and increases manufacturing costs.

Thus, as discussed in paragraph 0017 of the present disclosure, the present invention provides an apparatus and method for stably generating a tracking error signal (or a DPP signal) *irrespective of a change in a disc track pitch without complicating the structure of an optical recording/reproducing system, thereby performing a stable servo control.*

Further, as discussed in paragraph 0045 of the present disclosure, conventionally, a change in a disc track pitch results in a change in the amplitude of an AC component waveform of an SPP signal, thereby preventing stable generation of a DPP signal. However, according to the embodiment of the present invention, AC components are removed from the SPP signal and, as a result, a DPP signal can be stably generated regardless of a disc track pitch.

Additionally, Figs. 8 and 9 clearly show the distinction between using a high pass filter that removes AC components and not using a filter that removes AC components such that only DC components remain. Thus, as discussed in paragraph 0048, a filter is built in a tracking error signal generating circuit that generates a tracking error signal using a DPP method so as to remove AC components from an SPP signal. Therefore, a tracking error signal can be stably generated regardless of a disc track pitch.

Thus, the benefit in having a high-pass filter which removes AC components from the SPP signal such that only DC components of the SPP signal remain, as opposed to having only a low-pass filter in which only low frequency components are extracted, as in Deguchi, is because removing the AC component from the SPP signal allows for a DPP signal to be stably generated regardless of a disc track pitch. Therefore, utilizing a high-pass filter in such an arrangement solves the problem of (a) unstable generation of the DPP signal and (b) minimizing the complication of the structure. Therefore, it would not have been an "obvious matter of design choice" to replace the low pass filter 109 of Deguchi with a high pass filter that removes an AC component because if a high pass filter is instead used, then the DPP signal can be stably generated regardless of a disc track pitch. Also, utilizing only one filter to generate the DPP signal results in a less expensive and less complicated structure. Further, the low pass filter 109 of Deguchi does not remove an AC component such that only DC components remain, but instead removes only a low frequency component of the signal.

Additionally, looking at Figs. 8 and 9, the present specification clearly discloses the unexpected results that occur from utilizing a high pass filter in the structure of the present invention. Figs. 8 and 9 illustrate the difference that occurs from providing a high pass filter that removes AC components of the signal such that only DC components remain.

Dependent Claims 2, 5 and 8

Dependent claim 2 recites that "the MPP signal generating unit generates the MPP signal by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP = (a+d) - (b+c) and the SPP signal generating unit generates the SPP signal by performing an operation on the electrical signals a, b, c, and d which satisfies an equation SPP = (a+c) - (b+d), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_C, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main photodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction...."

Dependent claims 5 and 8 recite similar features to that recited in claim 2.

Deguchi discloses that the main beam tracking error signal is obtained from the equation T_{E0} = (SC + SD) – (SA + SB) and the side beam tracking error signal is obtained from the equation T_{E1} = SE – SF, where the photodetecting units A, C, D, B are positioned at four quadrants in a clockwise direction.

First, the main beam tracking error signal uses the equation T_{E0} = (SC + SD) – (SA + SB), which is equivalent to the equation MPP = (b+c) - (a+d) of the photodetecting units of the present invention. Thus, the main beam tracking error signal is not obtained by the equation MPP = (a+d) - (b+c).

Second, the side beam tracking error signal is obtained from the equation T_{E1} = SE – SF, where photodetecting units E and F are positioned on respective sides of the four photodetecting units A, B, C, D. However, the present invention of claims 2, 5 and 8 obtains the side beam tracking error signal from the equation SPP = (a+c) - (b+d), which does not utilize side photodetecting units PD_E and PD_F.

Thus, Deguchi does not suggest determining the main beam and side beam tracking error signals in the same manner as the present invention.

Conclusion

Therefore, as the combination of the teachings of Deguchi and the Alleged Admitted Art does not suggest all the features of independent claims 1, 4, 7, 10, 11, 14, 17, 20 and 23, and does not suggest all the features of dependent claims 2, 5 and 8, claims 1, 2, 4, 5, 7, 8, 10, 11, 14, 17, 20 and 23 patentably distinguish over Deguchi in view of the Alleged Admitted Art.

Claims 3, 6, 9, 12, 13, 15, 16, 18, 19, 21 and 22 depend either directly or indirectly from independent claims 1, 4, 7, 11, 14, 17 and 20. Therefore, claims 3, 6, 9, 12, 13, 15, 16, 18, 19, 21 and 22 patentably distinguish over the references relied upon for at least the reasons claims 1, 4, 7, 11, 14, 17 and 20 patentably distinguish over the references relied upon.

In summary, the Applicants submit that claims 1-23 patentably distinguish over the reference relied upon. Accordingly, the Applicants respectfully request reversal of the Examiner's rejection.

The Commissioner is authorized to charge any Appeal Brief fee or Petition for Extension of Time fee for underpayment, or credit any overpayment, to Deposit Account No. 19-3935.

Respectfully submitted,

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VIII. Claims Appendix (37 C.F.R. § 41.37(c)(1)(viii))

1. A tracking error signal generating apparatus comprising:

a main beam push pull (MPP) signal generating unit which generates an MPP signal according to electrical signals output by main photodetecting units based on a calculated deviation of beam powers detected by the main photodetecting units arranged on right and left sides of a specific track, respectively;

a side beam push pull (SPP) signal generating unit which generates an SPP signal according to electrical signals output by photodetecting units based on a calculated deviation of beam powers detected by the photodetecting units, the photodetecting units being one of pairs of the main photodetecting units diagonally arranged with respect to the track and side photodetecting units disposed on opposing sides of the track and outside of the main photdetecting units;

a high-pass filter which removes an AC component from the SPP signal such that only DC components of the SPP signal remain; and

a subtractor which generates a tracking error signal by calculating a difference between the MPP signal and the DC components of the SPP signal,

wherein the high-pass filter is connected in series between an output terminal of the side beam push pull signal generating unit and a ground terminal.

2. The apparatus of claim 1, wherein the MPP signal generating unit generates the MPP signal by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP = (a+d) - (b+c) and the SPP signal generating unit generates the SPP signal by performing an operation on the electrical signals a, b, c, and d which satisfies an equation SPP = (a+c) - (b+d), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_C, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main photodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, and wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track.

3. The apparatus of claim 1, wherein the MPP signal generating unit generates an MPP signal by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP= (a+d) - (b+c) and the SPP signal generating unit generates an SPP signal by performing an operation on electrical signals e and f which satisfies an equation SPP= (e-f), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_C, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main phtodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track, wherein the side photodetectors comprise side photodetecting units PD_E and PD_F which respectively output electrical signals e and f, and wherein the side photodetecting units PD_E and PD_F are symmetrically arranged at opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, and PD_D.

4. A method of generating a tracking error signal comprising:

calculating a difference between an MPP signal and an SPP signal whose AC components are removed via a high-pass filter such that only DC components of the SPP signal remain,

wherein the MPP signal is obtained by calculating a deviation of beam powers detected by main photodetecting units which are arranged in right and left directions with respect to a track and the SPP signal is obtained by calculating a deviation of beam powers detected by photodetecting units which are one of pairs of the main photodetectors diagonally arranged with respect to the track and side photodetecting units disposed on opposing sides of the track and outside of the main photodetecting units,

wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

5. The method of claim 4, wherein the MPP signal is obtained by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP = (a+d) - (b+c) and the SPP signal generating unit generates the SPP signal by performing an operation on the electrical signals a, b, c, and d which satisfies an equation SPP = (a+c) - (b+d), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_c, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main photodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, and wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track.

6. The method of claim 4, wherein the MPP signal is obtained by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP= (a+d) - (b+c) and the SPP signal generating unit generates an SPP signal by performing an operation on electrical signals e and f which satisfies an equation SPP= (e-f), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_C, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main phtodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track, wherein the side photodetectors comprise side photodetecting units PD_E and PD_F which respectively output electrical signals e and f, and wherein the side photodetecting units PD_E and PD_F are symmetrically arranged at opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, and PD_D.

7. An optical recording/reproducing system, comprising:

a pickup which emits a laser beam toward an optical medium and detects a reflected laser beam reflected from a disc;

a tracking error signal generating unit that generates a tracking error signal by calculating a difference between an MPP signal obtained by calculating a deviation of beam powers detected by main photodetecting units which are arranged in right and left directions with respect to a track and an SPP signal obtained by calculating a deviation of beam powers detected by photodetecting units which are one of main photodetecting units diagonally arranged with respect to the track and signals output by side photodetecting units disposed on opposing sides of the main photodetectors;

a high-pass filter which removes AC components from the SPP signal such that only DC components of the SPP signal remain, the AC components being removed before the signal is received by the tracking error signal generating unit;

a servo controller which generates a tracking driving signal which is used to move an optical system of the pickup in a radial direction so as to direct the laser beam at a center of the track, using the tracking error signal; and

a tracking servo driving unit which drives a tracking actuator included in the pickup in response to the tracking driving signal,

wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

8. The system of claim 7, wherein the MPP signal is obtained by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP = (a+d) - (b+c) and the SPP signal generating unit generates the SPP signal by performing an operation on the electrical signals a, b, c, and d which satisfies an equation SPP = (a+c) - (b+d), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_c, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main photodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, and wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track.

9. The system of claim 7, wherein the MPP signal is obtained by performing an operation on electrical signals a, b, c, and d which satisfies an equation MPP= (a+d) - (b+c) and the SPP signal generating unit generates an SPP signal by performing an operation on electrical signals e and f which satisfies an equation SPP= (e-f), wherein the main photodetecting units comprise main photodetecting units PD_A, PD_B, PD_C, and PD_D which respectively output the electrical signals a, b, c, and d, wherein the main phtodetecting units PD_A, PD_B, PD_C, and PD_D are positioned at four quadrants in a clockwise direction, wherein the main photodetecting units PD_A and PD_D are symmetrically arranged with the main photodetecting units PD_B and PD_C with respect to the track, wherein the side photodetectors comprise side photodetecting units PD_E and PD_F which respectively output electrical signals e and f, and wherein the side photodetecting units PD_E and PD_F are symmetrically arranged at opposing sides of the track and outside of the main photodetecting units PD_A, PD_B, PD_C, and PD_D.

10. A computer readable medium encoded with processing instructions for implementing a method of generating a tracking error signal, the method comprising:

calculating a difference between an MPP signal and an SPP signal whose AC components are removed via a high-pass filter such that only DC components of the SPP signal remain,

wherein the MPP signal is obtained by calculating a deviation of beam powers detected by main photodetecting units which are arranged in right and left directions with respect to a track and the SPP signal is obtained by calculating a deviation of beam powers detected by photodetecting units which are one of pairs of the main photodetectors diagonally arranged with respect to the track and side photodetecting units disposed on opposing sides of the track and outside of the main photodetecting units,

wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

11. A tracking error signal generator comprising:

a main push pull (MPP) signal generator which generates an MPP signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions disposed on an opposing side of the track;

a side push pull (SPP) signal generator which generates an SPP signal based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions diagonally disposed with respect to the track in a second direction normal to the first and a fifth signal output by a first side photodetector and a sixth signal output by a second side photodetector;

a high-pass filter which removes an AC component from the SPP signal such that only DC components of the SPP signal remain; and

a subtractor which generates a tracking error signal based on a difference between the MPP signal and the DC components of the SPP signal,

wherein the high-pass filter is connected in series between an output terminal of the side push pull signal generator and a ground terminal.

12. The tracking error signal generator of claim 11, wherein the main photodetecting portions are positioned at four quadrants of a photodetector in a clockwise direction and the main photodetecting portions on the first side of the track are symmetrically arranged with the main photodetecting portions on the opposing side of the track.

13. The tracking error signal generator of claim 11, wherein the side photodetectors are disposed at opposing sides of the track and outside of the main photodetectors

14. A method of generating a tracking error signal, comprising:

generating a main push pull (MPP) signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions disposed on an opposing side of the track;

generating a side push pull (SPP) signal based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions diagonally disposed with respect to the track in a second direction normal to the first and a firth sum signal output by a first side photodetector and a sixth sum signal output by a second side photodetector;

removing an AC component from the SPP signal via a high-pass filter such that only DC components of the SPP signal remain; and

generating a tracking error signal based on a difference between the MPP signal and the DC components of the SPP signal,

wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

15. The method of claim 14, wherein the main photodetecting portions are positioned at four quadrants of a photodetector in a clockwise direction and the main photodetecting portions on the first side of the track are symmetrically arranged with the main photodetecting portions on the opposing side of the track.

16. The method of claim 14, wherein the side photodetectors are disposed at opposing sides of the track and outside of the main photodetectors.

17. A computer readable medium encoded with processing instructions for implementing a method of generating a tracking error signal, the method comprising:

generating a main push pull (MPP) signal based on a difference between a first sum signal representing the sum of signals output from main photodetecting portions disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions disposed on an opposing side of the track;

generating a side push pull (SPP) based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions diagonally disposed with respect to the track in a second direction normal to the first and a firth sum signal output by a first side photodetector and a sixth sum signal output by a second side photodetector;

removing an AC component from the SPP signal via a high-pass filter such that only DC components of the SPP signal remain; and

generating a tracking error signal based on a difference between the MPP signal and the DC components of the SPP signal,

wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

18. The computer readable medium of claim 17, wherein the main photodetecting portions are positioned at four quadrants of a photodetector in a clockwise direction and the main photodetecting portions on the first side of the track are symmetrically arranged with the main photodetecting portions on the opposing side of the track.

19. The computer readable medium of claim 17, wherein the side photodetectors are disposed at opposing sides of the track and outside of the main photodetectors.

20. An optical recording/reproducing system, comprising:

a pickup having a light beam generator which generates a light beam, an optical system which focuses the light beam onto an optical medium, a focus/tracking actuator which moves the optical system in a radial direction with respect to the optical medium in response to a tracking driving signal so as to direct the light beam at a specific track on the optical medium, and a photodetector section including main photodetecting portions which receive the light beam after the light beam is reflected from the optical medium and output respective signals in response thereto;

a high-pass filter which removes AC components from the SPP signal such that only DC components of the SPP signal remain, the AC components being removed before the signal is received by the tracking error signal generating unit;

a tracking error signal generator which generates a tracking error signal representing a difference between a main push pull (MPP) signal and a side push pull (SPP) generator;

a servo controller which generates the tracking driving signal based on the tracking error signal,

wherein the MPP signal is generated based on a difference between a first sum signal representing the sum of signals output from the main photodetecting portions disposed on a side of a track and a second sum signal representing the sum of signals output by the main photodetecting portions disposed on an opposing side of the track,

wherein the SPP signal is generated based on a difference between one of a third sum signal representing the sum of signals output from the main photodetecting portions which are diagonally disposed with respect to the track in a first direction and a fourth sum signal representing the sum of signals output by the main photodetecting portions diagonally disposed with respect to the track in a second direction normal to the first and a fifth signal output by a first side photodetector and a sixth signal output by a second side photodetector,

and wherein the high-pass filter is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

21. The optical recording/reproducing system of claim 20, wherein the main photodetecting portions are positioned at four quadrants of a photodetector in a clockwise direction and the main photodetecting portions on the first side of the track are symmetrically arranged with the main photodetecting portions on the opposing side of the track.

22. The optical recording/reproducing system of claim 20, wherein the side photodectors are disposed at opposing sides of the track and outside of the main photodetectors.

23. A filter in a tracking error signal generating circuit which generates a tracking error signal using a differential push pull method, comprising:

a high-pass AC component remover which removes an AC component from a side beam push pull (SPP) signal such that only DC components of the SPP signal remain,

wherein the SPP signal is obtained by using electrical signals output by photodetecting units based on a calculated deviation of beam powers detected by the photodetecting units, the photodetecting units being one of pairs of the main photodetecting units diagonally arranged with respect to the track and side photodetecting units disposed on opposing sides of the track and outside of the main photdetecting units, and

wherein the tracking error signal can be stably generated regardless of a disc track pitch, and

wherein the high-pass AC component remover is connected in series between an output terminal of a generator of the SPP signal and a ground terminal.

IX. Evidence Appendix (37 C.F.R. § 41.37(c)(1)(ix))

None

X. Related Proceedings Appendix (37 C.F.R. § 41.37(c)(1)(x))

None